

PCT/PTO 04 MAY 2000

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

2867-0185-2 PCT

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09 / 530579

INTERNATIONAL APPLICATION NO.
PCT/SE98/01975INTERNATIONAL FILING DATE
30 OCTOBER 1998PRIORITY DATE CLAIMED
04 NOVEMBER 1997

TITLE OF INVENTION

RESOURCE OPTIMIZATION FUNCTION IN A DATA AND TELECOMMUNICATIONS SYSTEM

APPLICANT(S) FOR DO/EO/US

TELIA RESEARCH AB

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☐ Certificate of Mailing by Express Mail
19. ☒ Other items or information:

Request for Consideration of Documents Cited in International Search Report

Notice of Priority

PCT/IB/304

PCT/IB/308

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/530579)	INTERNATIONAL APPLICATION NO PCT/SE98/01975	ATTORNEY'S DOCKET NUMBER 2867-0185-2 PCT
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20. The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

- ☐ Search Report has been prepared by the EPO or JPO \$840.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) \$670.00
- ☐ No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$760.00
- ☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$970.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$96.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

\$970.00

Surcharge of **\$130.00** for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$130.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	7 - 20 =	0	x \$18.00
Independent claims	1 - 3 =	0	x \$78.00
Multiple Dependent Claims (check if applicable).			<input type="checkbox"/>

\$0.00

\$0.00

\$0.00

TOTAL OF ABOVE CALCULATIONS =

\$1,100.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable).

☐

\$0.00

SUBTOTAL =

\$1,100.00

Processing fee of **\$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

\$0.00

TOTAL NATIONAL FEE =

\$1,100.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).

☐

\$0.00

TOTAL FEES ENCLOSED =

\$1,100.00

Amount to be: refunded	\$
charged	\$

- ☒ A check in the amount of **\$1,100.00** to cover the above fees is enclosed.
- ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.
- ☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **15-0030** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

OBLON, SPIVAK, McCLELLAND, MAIER & NEUSTADT, P.C.
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Arlington, Virginia 22202
703-413-3000

WILLIAM E. BEAUMONT
REGISTRATION NUMBER 30,996

SIGNATURE

Marvin J. Spivak

NAME

24,913

REGISTRATION NUMBER

May 3, 2000

DATE

2867-0185-2 PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :
TELIA RESEARCH AB : ATTN: APPLICATION DIVISION
SERIAL NO: NEW U.S. PCT APPLN :
(Based on PCT/SE98/01975)
FILED: HERewith :
FOR: RESOURCE OPTIMIZATION :
FUNCTION IN A DATA AND
TELECOMMUNICATIONS SYSTEM

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Prior to a first examination on the merits, please amend the above-identified
application as follows:

IN THE SPECIFICATION

Page 1, between prenumbered lines 2 and 5, insert:

--BACKGROUND OF THE INVENTION--;

prenumbered line 15, replace "PRIOR" with --BACKGROUND--.

IN THE CLAIMS

Please amend the claims as follows.

Claim 1, line 3, delete "(101)", same line, delete "(105)";

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line 7, delete "(102)";

line 10, delete "(106)";

line 16, delete "(105)".

Claim 2, line 8, delete "(105)".

Claim 3, line 1, delete "or 2".

Claim 4, line 5, delete "(105)";

line 6, delete "(101)".

Claim 5, delete "some of the previous"; same line, replace "claims" with --claim 1--.

Claim 6, line 4, delete "(105)";

line 5, delete "(103)";

line 6, delete "(102)".

Claim 7, line 1, delete "some of the previous"; same line, replace "claims" with
--claim 1--;

line 3, delete "(102)".

IN THE ABSTRACT

Please delete the original abstract on page 11 in its entirety and insert therefor:

--ABSTRACT

A method at a telecommunications system and a data communications system which adapts resource reservation protocol for fixed networks to radio networks with large variation in bandwidth and quality. At hierarchical coding, a data stream is divided into separate data streams with different priorities. By a resource reservation protocol, then resources in the fixed network for the data streams are reserved. A node in the fixed network throws the data streams according to a predecided priority if the transmission capacity of the node decreases. If the transmission capacity at this node decreases, and the quality requirement of a data stream fails to be kept up, the data stream in question is thrown. After that, the node transmits a message to the nodes where the resource reservations are, towards the transmitter with the following content of: (1) update the resource reservations for the data stream, i.e. keep the resource reservations which are required to transmit the data stream; (2) use the reserved resource temporarily for other traffic; and (3) throw the data stream until different is stated.--

REMARKS

Favorable consideration of this application, as presently amended, is respectfully requested.

The present preliminary amendment is submitted to place the above-identified application in more proper format under United States practice. By the present preliminary amendment, the specification has been amended to include all suggested headings. The claims have been amended to no longer recite any multiple dependencies or reference numerals. A new abstract believed to be in more proper format under United States practice is also submitted herein.

The present application is believed to be in condition for a full and thorough examination on the merits. An early and favorable consideration of the present application is hereby respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



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TITLE OF THE INVENTION: RESOURCE OPTIMIZATION FUNCTION IN A
DATA AND TELECOMMUNICATIONS SYSTEM

5 FIELD OF THE INVENTION

The present invention relates to a method at a data and telecommunications system for transmission of data streams between a receiving terminal and a transmitting terminal via at least one fixed network including just any
10 number of nodes and another network consisting of links with large variation in bandwidth and quality, at which a resource reservation protocol reserves resources in said fixed network for said data streams.

15 PRIOR ART

A computer transmits data over a network to a receiving computer. At hierarchical coding, a data stream (with real time requirements, i.e. demands on controlled delay) is divided into separate data streams with different
20 priorities. The data streams have different demands on quality. By a resource reservation protocol, resources then are reserved in the network for the data streams. Separate reservations are made for each data stream in all nodes from the receiver to the transmitter. At hierarchical
25 coding, the node throws data streams according to a predefined priority if the transmission capacity of the node has decreased. Since the data streams have real time demands, data will not be buffered.

When hierarchical coding is used over a radio channel
30 with large variation in bandwidth and quality, the number of data streams which can be transmitted over the radio channel will vary rapidly. The radio channel is the transmission link which in most cases will set a limit to the number of data streams that can be transmitted to the
35 receiver. The data streams that are stopped at the node closest to the radio channel are still transmitted in the

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fixed network and therefore load the fixed network without due cause. At the same time, the receiver wants to keep its reservations in the network also during the time when some data streams are stopped, because the reservation may not
5 be possible to retrieve if it is deleted. At unicast traffic, i.e. one receiver of data streams and separate resource reservations for each receiver, it is possible to signal to the transmitter to stop the transmission of a data stream. At multicast traffic, i.e. a plurality of
10 receivers of the same data streams, resources are reserved in common in nodes with data streams in common. For that reason the transmitter cannot stop the transmission of a data stream since all other receivers then should be affected.

15 The aim of the present invention consequently is to solve this problem and provide multicast traffic without loading the fixed network without due cause.

SUMMARY OF THE INVENTION

20 This aim is achieved by a method at a data and telecommunications system for transmission of data streams between a receiving terminal and a transmitting terminal via at least one fixed network including just any number of nodes and another network consisting of links with large
25 variation in bandwidth and quality, where a resource reservation protocol reserves resources in said fixed network for said data streams, at which said protocol attends to that if the transmission capacity of a node decreases and falls below the quality requirements of a
30 specific data stream, said specific data stream is thrown, whereupon said node transmits a message which is executed in all nodes in said fixed network where resource reservations are provided towards said transmitting terminal, which message includes the steps of:

- updating said resource reservation for said specific data stream;
- 5 - utilizing said resource reservation temporarily for other traffic;
- throwing said specific data stream until different is stated.

10 The invention shows a plurality of advantages in comparison with known technology. For instance, the fixed network will, with this resource optimization function, have a considerable capacity improvement, i. e. the network will not be loaded by data which in any case is thrown at
15 the node of lacking capacity.

 The receiver will not lose its resource reservations during the time a data stream is stopped, which can happen if the receiver has to make new resource reservations each time the number of data streams is changed.

20 Resources which in other cases would not be utilized during the time a data stream is momentarily stopped, now can be utilized.

 At multicast traffic, data will be thrown in a node as close to the transmitter as possible, without other
25 receivers of the multicast traffic being affected.

 Further characteristics of the present invention are given in the sub-claims.

BRIEF DESCRIPTION OF THE DRAWINGS

30 In the following a detailed description of an embodiment of the invention is given, with reference to the enclosed drawings, of which:

 Figure 1 is a diagrammatical presentation of the tele and data communications system according to the invention;

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Figure 2 is a diagrammatical presentation of a graph related to hierarchical coding according to the present invention.

5 DETAILED DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

Figure 1 shows a mobile computer, 101, connected to a fixed network, 102, consisting of nodes (N) via a radio channel with varying quality. The dashed arrow shows data streams which are transmitted to the mobile node 101. The
10 bold arrow shows data streams which are in common for all receivers 101 and 103.

The mobile computer 101 can receive unicast traffic and multicast traffic. At unicast traffic, the nodes deal with the resource reservations of the data streams
15 separately. At multicast traffic, the nodes deal with the resource reservations in common when the data streams are in common for all receivers 101 and 103. In Figure 1, the node 104, closest to the receiver 105, deals with the resource reservations in common.

20 The invention is primarily intended for the functionality in the node 106 at the interface towards the radio network, and in the nodes 104 and 107 which the data streams pass on the path from the transmitter 105, i.e. the computer, to the receiver 101, i.e. the mobile computer.

25 The functionality adapts resource reservation protocols created for fixed networks 102 to networks consisting of links with larger variations in bandwidth and quality, preferably radio networks. Previously known technology does not deal with resource optimization at
30 resource reservations and hierarchical coding over links with varying quality.

Theoretically, the resource optimization function solves the network utilization problem at hierarchical coding, both for unicast traffic and multicast traffic.

35 If the transmission capacity at a node (in most cases the node 106 at the radio channel), see Figure 1,

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decreases, and the quality requirement of a data stream is no longer maintained, then the data stream in question will be thrown. After that the node transmits a message to the nodes (where the resource reservations are) towards the transmitter 105 (the computer in Figure 1) with the following content:

- Update the resource reservation for the data stream, i.e. keep the resource reservations that are required to transmit the data stream.
- Use the reserved resource temporarily for other traffic.
- Throw the data stream until different is stated.

If the transmission capacity in the node increases, and the quality requirement for a data stream is fulfilled, the data stream shall be transmitted again. The node transmits a message to the nodes (where the resource reservations are) towards the transmitter 105 with the following content:

- Update the resource reservation for the data stream, i.e. keep the resource reservations that are required for transmission of the data stream.
- Use the reserved resource for the intended data stream.

Both unicast and multicast traffic here are dealt with, with the same signalling message. At multicast traffic, resource reservations which are in common for a plurality of receivers 101 and 103 will not be affected.

Figure 2 shows the internal priority of the data streams, where the data stream 1 has the highest priority and is not limited in time by bandwidth functions.

Data streams 3 are strongly limited in time by the bandwidth function. The data streams consequently are

hierarchically coded, where data stream 1 is highest in the hierarchy.

In the following an example is given of a conceived scenario:

Mobile computer 101 receives data with real time demands (controlled delay) from a transmitting computer 105 (Figure 1).

The mobile computer 101 selects to receive the data stream in a plurality of data streams with different priorities (Figure 2).

In each node resources are reserved separately for each data stream.

The node 106 closest to the radio channel receives momentarily information about which transmission capacity that is available over the radio channel.

The bandwidth decreases, and the node 106 closest to the radio channel is forced to throw the lowest prioritized data stream (Figure 2).

In order not to overload the network 102 with data which in any case shall be thrown at the node 106, at the radio channel, a message is transmitted to the transmitter 105 (the computer) that it shall stop the transmission of the data stream of the lowest priority. The message which is transmitted to the transmitter 105 also contains the following information which is executed in all nodes 107 and 104 on the path to the transmitter 105:

- Update the resource reservation for the data stream, i.e. keep the resource reservations that are required to transmit the data stream.
- Use the reserved resource temporarily for other traffic.
- Throw the data stream until different is stated.

Both unicast and multicast traffic here are dealt with, with the same signalling message. In the cases when the resources reservation is in common, all subjacent nodes must require that certain data streams be stopped for this request being forwarded in the common reservation. Consequently the data streams will not always be thrown in the nodes 104 where the resource reservation is in common.

The bandwidth will increase and the node 106 closest to the radio channel decides that the data stream of the lowest priority again can be received.

A message is transmitted to the transmitter 105 that the data stream of the lowest priority shall be transmitted.

The message which is transmitted to the transmitter 105 contains the following information which is executed in all nodes 107 and 104 on the path to the transmitter 105.

- Update the resource reservation for the data stream, i.e. keep the resource reservations which are required to transmit the data stream.
- Use the reserved resource for the intended data stream.

The above mentioned is only to be regarded as an advantageous embodiment of the present invention, and the extent of protection is only defined by what is indicated in the following patent claims.

PATENT CLAIMS

1. Method at a data and telecoomuncations system for transmission of data streams between a receiving terminal
5 (101) and a transmitting terminal (105) via at least one fixed network (102) including just any number of nodes and another network consisting of links with large variation in bandwidth and quality, at which a resource reservation protocol reserves resources in said fixed network (102) for
10 said data streams, c h a r a c t e r i z e d in that said protocol attends to that, if the transmission capacity of a node, preferably the node (106) closest to said other network, decreases, and the quality requirement of a specific data stream fails to be kept up, said specific
15 data stream is thrown, whereupon said node by means of said protocol transmits a message which is executed in other nodes where said resource reservations are, to said transmitting terminal (105), which message includes the steps of:

- 20 - updating said resource reservation for said specific data stream;
- utilizing said resource reservation temporarily for other traffic;
- 25 - throwing said specific data stream until different is stated.

2. Method according to patent claim 1,

30 c h a r a c t e r i z e d in that if the transmission capacity in said node increases and the quality requirement for said specific data stream is fulfilled, said specific data stream shall be transmitted again, at which said node by means of said protocol transmits a message to said
35 second nodes, where said resource reservations are, towards

said transmitting terminal (105), which message includes the steps of:

- updating the resource reservation for said specific data stream;
- using said resource reservation for said specific data stream.

3. Method according to patent claim 1 or 2, characterized in that said other network is a radio network including at least one radio channel.
4. Method according to patent claim 3, characterized in that said node constitutes an interface towards said radio channel, at which said radio channel sets the limit regarding how many data streams that can be transmitted from said transmitting terminal (105) to said receiving terminal (101).
5. Method according to some of the previous patent claims, characterized in that it is utilized at hierarchical coding of said data streams.
6. Method according to patent claim 1, characterized in that, at multicast traffic, said specific data stream in said other node as close to said transmitting terminal (105) as possible, is thrown without other receiving terminals (103) of the multicast traffic being affected, whereby said fixed network (102) is not loaded by said specific data stream, which in any case is thrown at said node lacking capacity.
7. Method according to some of the previous patent claims, characterized in that said node in said fixed network (102) which constitutes radio interface towards

said radio channel receives momentary information about
which transmission capacity that is available on said radio
channel, at which said node by means of said protocol
reserves resources in said fixed network regarding the
5 transmission capacity of said radio channel.

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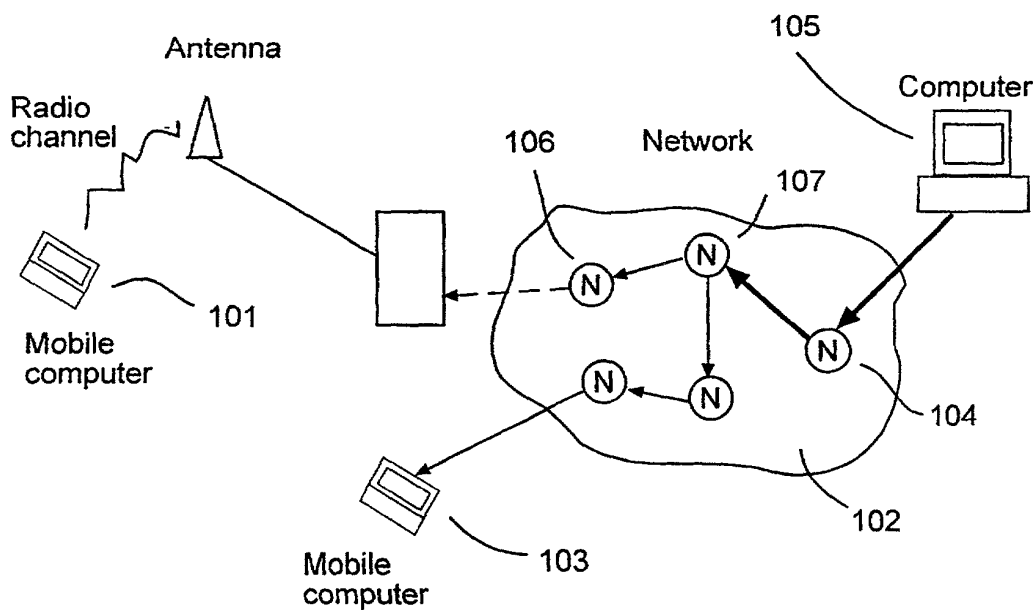


Figure 1

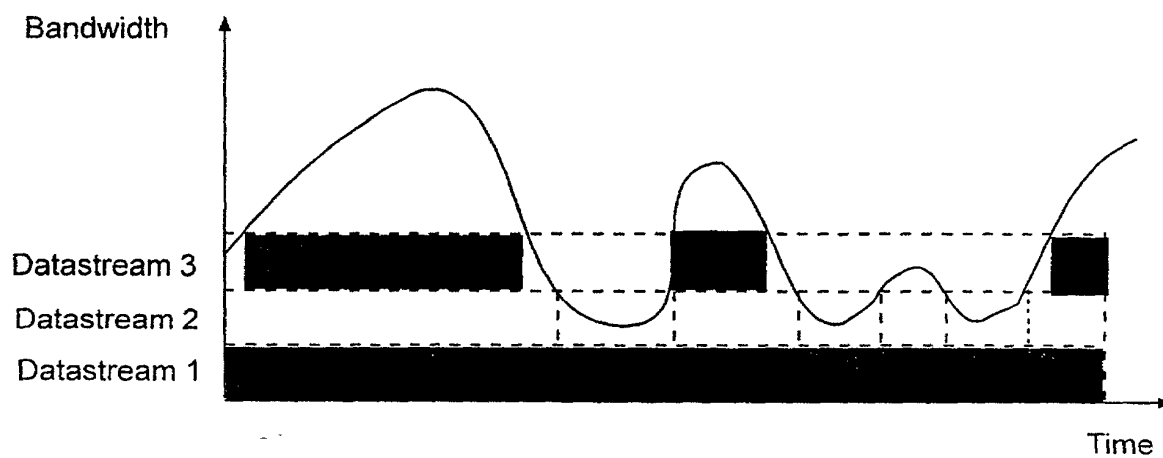


Figure 2

Declaration, Power Of Attorney and Petition

Page 1 of 3

WE (I) the undersigned inventor(s), hereby declare(s) that:

My residence, post office address and citizenship are as stated below next to my name,

We (I) believe that we are (I am) the original, first, and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

RESOURCE OPTIMIZATION FUNCTION IN A DATA AND TELECOMMUNICATIONS SYSTEM

the specification of which

☐ is attached hereto.

☒ was filed on 04 May 2000 as

Application Serial No. 09/530,579

and amended on

☒ was filed as PCT international application

Number PCT/SE98/01975

on 30 October 1998,

and was amended under PCT Article 19

on (if applicable).

We (I) hereby state that we (I) have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We (I) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations.

We (I) hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed. Prior Foreign Application(s)

Application No.	Country	Day/Month/Year	Priority Claimed
9704020-8	SWEDEN	04 November 1997	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No

We (I) hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

(Application Number)	(Filing Date)
(Application Number)	(Filing Date)

We (I) hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

Application Serial No.	Filing Date	Status (pending, patented, abandoned)
PCT/SE98/01975	30 October 1998	

And we (I) hereby appoint: Norman F. Oblon, Reg. No. 24,618; Marvin J. Spivak, Reg. No. 24,913; C. Irvin McClelland, Reg. No. 21,124; Gregory J. Maier, Reg. No. 25,599; Arthur I. Neustadt, Reg. No. 24,854; Richard D. Kelly, Reg. No. 27,757; James D. Hamilton, Reg. No. 28,421; Eckhard H. Kuesters, Reg. No. 28,870; Robert T. Pous, Reg. No. 29,099; Charles L. Gholz, Reg. No. 26,395; William E. Beaumont, Reg. No. 30,996; Jean-Paul Lavalleye, Reg. No. 31,451; Stephen G. Baxter, Reg. No. 32,884; Richard L. Treanor, Reg. No. 36,379; Steven P. Weihrouch, Reg. No. 32,829; John T. Goolkasian, Reg. No. 26,142; Richard L. Chinn, Reg. No. 34,305; Steven E. Lipman, Reg. No. 30,011; Carl E. Schlier, Reg. No. 34,426; James J. Kulbaski, Reg. No. 34,648; Richard A. Neifeld, Reg. No. 35,299; J. Derek Mason, Reg. No. 35,270; Surinder Sachar, Reg. No. 34,423; Christina M. Gadiano, Reg. No. 37,628; Jeffrey B. McIntyre, Reg. No. 36,867; William T. Enos, Reg. No. 33,128; Michael E. McCabe, Jr., Reg. No. 37,182; Bradley D. Lytle, Reg. No. 40,073; and Michael R. Casey, Reg. No. 40,294; our (my) attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith; and we (I) hereby request that all correspondence regarding this application be sent to the firm of OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C., whose Post Office Address is: Fourth Floor, 1755 Jefferson Davis Highway, Arlington, Virginia 22202.

We (I) declare that all statements made herein of our (my) own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

100 Jonas MALMKVIST
NAME OF FIRST SOLE INVENTOR

Jonas Malmkvist
Signature of Inventor

20 July 2000
Date

Residence: Spelvagen 6, bv, S-142 62

Trangsund, SWEDEN *SEX*

Citizen of: SWEDEN

Post Office Address: SAME AS ABOVE

200

Stefan SANDELL

NAME OF SIXTH JOINT INVENTOR

/ Stefan Sandell

Signature of Inventor

/ 4 August 2000

Date

NAME OF SEVENTH JOINT INVENTOR

Signature of Inventor

Date

NAME OF EIGHTH JOINT INVENTOR

Signature of Inventor

Date

NAME OF NINTH JOINT INVENTOR

Signature of Inventor

Date

Residence: Skorpionens gata 529, 6,

S-136 61 Haninge, SWEDEN SEX

Citizen of: SWEDEN

Post Office Address: SAME AS ABOVE

Residence:

Citizen of:

Post Office Address:

Residence:

Citizen of:

Post Office Address:

Residence:

Citizen of:

Post Office Address: